REMARKS

Preliminarily, Applicants respectfully request the Examiner to acknowledge the claim for domestic priority to provisional Application No. 60/121,436 filed February 23, 1999 as set forth in the Declaration and Power of Attorney and at page 1 of the specification (see Preliminary Amendment).

Review and reconsideration on the merits are requested.

Claims 1-21 and 30-33 were rejected under 35 U.S.C. § 102(e) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over U.S. Patent 5,910,383 to Hase et al. The Examiner considered Hase et al as disclosing a graphite powder for use in a lithium battery negative electrode meeting the terms of the rejected claims. In reference to Example 1 bridging cols. 7-8, Hase et al is cited as teaching a graphite powder having a specific surface area of 0.85 m^2/g, an aspect ratio of not greater than 2, a C_o value 6.73 Å, an average particle size of 16 μm, with no particles of 48 μm or greater and less than 3 wt% of particles 2 μm and smaller. Although not specifically disclosed, the Examiner considered that the subject graphite powder would inherently meet the claimed (tapping) bulk density, oxidation initiation temperature and electrical resistance value, for the reason that the graphite powder of Hase et al is said to be produced by the same process as that of the claimed invention.

Applicants traverse, and respectfully request the Examiner to reconsider in view of the amendment to claim 1 and the following remarks.

Initially, it is noted that claim 1 has been amended to incorporate therein the recitation of claim 2, to recite that the graphite powder has an oxidation initiation temperature of not less than 600°C. As shown below, the graphite powder of Hase et al does not meet this aspect of the

invention. Claim 2 has been amended to recite that the graphite powder has a tapping bolt density of not less than 0.9 g/cm^3. Support is found, for example, at page 13, lines 3-5 of the specification.

As described in Hase et al, column 1, lines 39 to 41, if the heat treatment of each pitch is continued as is, the whole pitch is eventually converted into coke. To obtain the fine particles of mesophase pitch, it is necessary to separate the fine particles in the course of the formation of the fine particles. Regarding the process of coking, for example, as described in Hase et al, column 4, lines 38-43, a content of quinoline-insoluble components higher than 85 wt% is accompanied by problems such that coking of the vacuum distillation residual pitch proceeds to lose thermal fusibility. Furthermore, upon grinding the mesophase pitch, the resulting particles are not round and hence have a greater aspect ratio.

To solve these problems, Hase et al describes that "the thus-ground product is then subject to oxidation treatment. This oxidation treatment is conducted preferably at an oxygen concentration of from 16 to 18 wt% or so" (column 5, lines 23-25). The aspect ratio after grinding and oxidation treatment falls within a range of from 1 to 2 (column 5, lines 58 and 59) and in the carbonization or graphitization treatment, no significant change takes place in the shape of the particles (column 6, lines 5-8). Therefore, one of ordinary skill would understand that the aspect ratio of the graphite particles obtained in Hase et al is about 1 to 2. In fact, in Example 1 in Hase et al, the mesophase pitch is ground in a jet mil, thereby obtaining a fine powder having an aspect ratio of not greater than 2, and is subject to oxidation, carbonization, and graphitization treatments to obtain graphite particles.

As described in the specification, page 22, lines 13 to 24, by carbonizing raw material such as petroleum pitch or coal pitch, coke is produced. Then, graphite powder is formed by pulverizing the coke and then graphitizing the particles. In the present invention, any type of coke can be used as a starting material, and therefore oxidation treatment of the pitch as conducted in the method of Hase et al is not required.

In the present invention, the carbon powder is graphitized after the properties thereof have been controlled, and thus, a carbon material for a lithium battery having a large discharge capacity, high charge and discharge efficiency, excellent cycle property, good coating performance and an increase in the carbon density of the electrode can be provided. In the comparative example in the specification, in which the properties of carbon powder have not been controlled prior to the graphitization, the tapping bulk density is lower than 0.8 g/cm^3.

Thus, Applicants respectfully dispute that the graphite powder of Hase et al has a tapping bulk density of not less than 0.8 g/cm^3 as required by claim 1. For this reason alone, the present claims are not anticipated by Hase et al.

To further define over the cited prior art, claim 1 has been amended to recite that the graphite powder has an oxidation initiation temperature of not less than 600°C. The significance of this aspect of the invention is as follows.

In the present specification, page 14, lines 19 to 24, the oxidation initiation temperature of the graphite powder is one of indices for graphite activity. Graphite powder having a high oxidation initiation temperature has a low activity and is therefore preferable for use in a battery.

The oxidation initiation temperature correlates not only the chemical activity of the graphite powder, but also with the shapes of the particles, the specific surface area and the like.

This aspect of the invention also is not disclosed by Hase et al.

Furthermore, in the graphite powder of the present invention, a specific electrical resistance of the powder along a direction perpendicular to the direction of the pressure is preferably not more than 0.06 Ω·cm, as claimed in claim 3.

This aspect of the invention is likewise not disclosed by Hase et al.

The basis for rejection was that the graphite powder of Hase et al would inherently meet the claimed tapping bulk density, oxidation initiation temperature and electrical resistance value, for the reason that the graphite powder of Hase et al is said to be produced by the same process as that of the claimed invention. However, as shown above, that is not the case.

In view of the amendment to the claims and the above remarks, it is respectfully submitted that the present invention is neither anticipated nor obvious over Hase et al, and withdrawal of the foregoing rejection is respectfully requested.

Claims 22-27 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Hase et al, further in view of admitted prior art (JP-A-8-31422). JP '422 was cited as disclosing a technique of adding boron to carbon powder and graphitizing the mixed powder. The reason for rejection was that it would have been obvious to add boron to the mesophase particles of Hase et al in order to improve crystallinity of the graphite powder.

Claims 28-29 were rejected under 35 U.S.C. § 103(a) as being unpatentable of Hase et al, further in view of U.S. Patent 5,591,547 to Yoneda et al. Yoneda et al was cited as teaching

polyvinylidene fluoride as a binding material for use with graphite powder in a lithium battery electrode.

Applicants rely on the response above with respect to the rejection of claims 1-21 and 30-33 over Hase et al.

In addition, Applicants separately traverse for the following reasons.

JP '422 discloses a technique of adding boron (B) to carbon powder and graphitizing the mixed powder, thereby elevating the crystallinity, as described in the present specification, page 3, lines 14 to 18. JP '422 does not disclose that the properties of carbon powder should be controlled prior to graphitization.

Yoneda et al discloses a graphite composite powder having copper oxide particles formed on the surface of the graphite particles (see claim 1), which is different from the present invention.

Withdrawal of the foregoing rejections is respectfully requested.

Withdrawal of all rejections and allowance of claims 1-33 is earnestly solicited.

In the event that the Examiner believes that it may be helpful to advance the prosecution of this application, the Examiner is invited to contact the undersigned at the local Washington, D.C. telephone number indicated below.

Respectfully submitted,

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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims are amended as follows:

1. (Amended) A carbon material for a lithium battery, comprising graphite powder having an oxidation initiation temperature of not less than 600°C, a specific surface area of not more than 3 m^2/g, an aspect ratio of not more than 6, and a tapping bulk density of not less than 0.8 g/cm^3.

2. (Amended) The carbon material for a lithium battery as claimed in claim 1, wherein [an oxidation initiation temperature of said graphite powder is not less than 600°C] said graphite powder has a tapping bulk density of not less than 0.9 g/cm^3.